Issued January 22, 1914.



# United States Department of Agriculture,

BUREAU OF PLANT INDUSTRY,

Seed Distribution,

WASHINGTON, D. C.

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# DISTRIBUTION OF COTTON SEED IN 1914.

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This is the twelfth distribution of cotton seed carried on by this office in cooperation with the cotton-breeding investigators of the Bureau of Plant Industry.

During the past 10 years 47 varieties of cotton have been distributed. These have all been bred by the experts of the Bureau of Plant Industry or selected by them because of special local value.

A change has been made in the method of sending out seed of improved varieties of cotton in order to increase the utility of the congressional distribution, in connection with the policy of encouraging the production of cotton on a community basis. The general distribution of a small quantity of seed (1 quart), to enable the farmer to become acquainted with the characters of the variety, is to be followed in the most promising communities by a special distribution of a larger quantity, enough to produce at least one full bale of the new variety and also to furnish a supply of seed for planting the entire crop of the next season.

Only one new variety is being sent out this year. It is now considered more important to establish a few superior varieties in general cultivation than to add to the number of new varieties. Experience with former distributions shows that supplies of pure seed must be maintained by the Department of Agriculture and repeated distributions made until a new variety has become well established.

An introductory statement on "The Improvement of the Cotton Crop by Selection," by Mr. O. F. Cook, who is in charge of the cotton-breeding work of this bureau, explains how the seed may be utilized to the best advantage by the farmer.

R. A. Oakley,
*Agronomist in Charge.*

Approved:
W. A. Taylor,
*Chief of Bureau.*

December 24, 1913.

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# THE IMPROVEMENT OF THE COTTON CROP BY SELECTION.

How can the farmer make the best use of a small stock of seed of a superior selected variety? By understanding and applying the methods by which select seed is produced, so as to keep the selected variety from deterioration. The usual way of treating a small quantity of select seed is not at all calculated to enable the farmer to learn the true value of a new variety or to preserve the purity of an improved stock.

### TESTING NOT TO BE COMBINED WITH SELECTION.

A mistake made frequently by farmers, and sometimes by professional breeders, is to attempt to combine testing with breeding. The new variety of cotton is planted by the side of the local variety or a mixed stock in order to test its behavior, and seed is saved from the same planting to increase the stock of the new variety. This plan is open to the serious danger that the seed of the new variety when gathered in the fall will not be pure, but will be contaminated by crossing with the local variety, so that its special value will be lost. The amount of crossing differs with the locality and the season, depending on the abundance of bees or other insects that carry the pollen from one flower to another, but there is usually too much crossing to make it safe to rely on the purity of any stock of seed that has been grown close to another variety of cotton.

### ISOLATION OF SEED PLATS.

A farmer who wishes to make a really adequate test of the value of a new variety should plant the seed in a separate plat, removed at least 300 yards from other fields of cotton or separated therefrom by 25 or 30 rows of corn. An isolated planting does not provide, of course, for a close comparison with the local variety, but this can be made in the following year to much better advantage. With the larger stock of seed then available a field planting can be made, as well as test plantings. In the third year there will be enough seed to stock even a large farm with the new variety, if it shows itself superior.

Many farmers are unwilling to give the proper care to a new variety until they have made a preliminary test and convinced themselves that it is really superior. It is for this reason that the plan of sending out a smaller quantity of seed in the general distribution has been adopted. Those who use this small sample of seed for testing purposes and plant it in the same field with another variety or a mixed stock of cotton are advised not to save seed in the fall with any idea that they are keeping a pure stock of the new variety in this way. If the farmer is convinced that the new variety is superior he should get a fresh stock of the seed and plant it in a separate breeding plat, as far away as possible from any other field of cotton.

The distribution of seed of superior varieties of cotton is no longer limited to a single season, as the custom formerly was. Unless improved varieties become established in cultivation in some part of the United States the work of breeding and distribution serves no useful purpose. To increase the number of varieties in a community is not desirable. On the contrary, there would be a distinct advantage if the whole community would grow one variety, if the best variety could be determined. The danger of mixture of varieties by crossing and the mixture of seed at the gin would both be reduced, and the uniformity of the product would enable the community to secure a higher price for its cotton.[1]

## WHY SELECTION MUST BE CONTINUED.

Unless selection is continued the value of a variety is sure to decline. A well-bred variety is superior to ordinary unselected cotton not only in having better plants but in having the plants more nearly alike. Whether selection has any power to make better plants is a question, but there can be no doubt of the power of selection to keep the plants alike. Even in the best and most carefully selected stocks inferior plants will appear, and if these are allowed to multiply and cross with the others the stock is sure to deteriorate. The pollen from the flowers of inferior plants is carried about by bees and other insects and the seeds developed from such pollen transmit the characters of the inferior parent. Even if they do not come into expression in the first generation they are likely to reappear in the second generation.

To grow cotton from unselected seed involves the same kind of losses as in an orchard planted with unselected seedling apple trees. Less cotton is produced and the quality is also inferior. The higher

[1] Some of the numerous advantages to be gained by a better organization of cotton-growing communities have been described in an article published in the Yearbook of the Department of Agriculture for 1911 under the title "Cotton Improvement on a Community Basis."

the quality of the cotton the more stringent is the requirement of a uniform staple. Unless the fibers have the same length and strength they can not be spun into fine threads or woven into strong fabrics.

### PRESERVATION OF VARIETIES BY SELECTION.

The method of selection to be followed in preserving a variety from deterioration is entirely different from that employed in the development of new varieties. The breeder of new varieties seeks for exceptional individuals and prefers those that are unlike any variety previously known. If the selection is being carried on to preserve a variety, the object is not to secure seed from the peculiar plants, but to reject all that deviate from the characters of the variety. The first qualification for such selection is a familiarity with the habits of growth and other characters of the variety, to enable the farmer or breeder to confine his selection to the plants that adhere to the "form" or "type" of the variety and to reject all that vary from the type. Most of the latter would prove to be very inferior and at the same time would increase the diversity of the variety and hasten its degeneration.

### IMPROVED METHODS OF FIELD SELECTION.

No matter how good a new variety may be or how carefully it may have been bred and selected, inferior plants are likely to appear, especially when it is grown under new and unaccustomed conditions. A special effort is being made to limit the distribution to seed from uniform fields of cotton, but selection is necessary to keep any variety from deterioration, and it is useless to wait until the deterioration becomes serious before beginning the selection. If proper attention be paid to the roguing out of inferior plants in the first season there may be much less variation in the second, the variety becoming better adjusted to the new conditions.

As uniformity is one of the first essentials of value in a variety, the behavior of a new variety in this respect is one of the first things to be noted. Do not wait till the crop matures, but watch the plants in the early part of the season. Even before the time of flowering it is possible to distinguish "freak" plants by differences in their habits of growth or the characters of their stems and leaves. Whenever such variations can be detected, they should be pulled out at once in order to prevent the crossing of the good plants with inferior pollen. After the bolls begin to reach mature size it is well to go through the plat again and pull out all plants that show by the small size or other peculiarities of the bolls that there has been a variation from the standards of the variety. These preliminary selections

greatly simplify the final selection in the fall, when attention can be limited to the yield and to the characters of the lint and seeds.[1]

### USE OF PROGENY ROWS IN SELECTION.

Selection can be made still more efficient by the use of progeny rows. The seed of select individual plants is picked separately into paper bags and planted the next season in adjacent rows, in order to test the behavior of the progenies of the different individuals. An inferior progeny can be rejected as a whole and selection limited to the best rows. It often happens that a very good plant produces a comparatively inferior progeny which would not be excluded from the stock unless the progeny-row test were made.

Nevertheless, the use of progeny rows is no substitute for skill and care in making the selection, for if the selected plants are not all of the true type of the variety, admixture by cross-pollination will occur in the progeny rows the same as in a mixed planting. Protection against the danger of crossing between different progenies can be secured by holding over a part of the seed of the select individuals used to plant the progeny rows. The remainder of the seed that produced the best progeny row can be planted in an isolated breeding plat in the year following the progeny test. In this way a special strain is developed from a single superior plant.

### METHODS OF TESTING COTTON VARIETIES.

The best way to test the behavior of two varieties of cotton is to plant them in alternate rows so that they can be compared carefully during the growing season and the yield of each row weighed separately at the end of the season. Of course, it is often possible to judge that one variety is superior to another without weighing, but if the results are nearly equal weighing is necessary. Even experienced cotton men are likely to make errors in guessing at the yields of different rows of the field. A variety that "scatters" its lint may appear to be yielding much more than a storm-proof variety with dense, compact lint that can be shown to be much more productive by comparison of actual weights of seed cotton and percentages of lint.[2]

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[1] Methods of selection are treated in greater detail in Circular No. 66 of the Bureau of Plant Industry, U. S. Department of Agriculture, entitled "Cotton Selection on the Farm," which can be obtained without cost upon application to the Secretary of Agriculture. See also Bulletin No. 159 of the Bureau of Plant Industry, U. S. Department of Agriculture, entitled "Local Adjustment of Cotton Varieties."

[2] See Circular No. 11 of the Bureau of Plant Industry, entitled "Danger in Judging Cotton Varieties by Lint Percentages," which may be had free of cost upon application to the Secretary of Agriculture.

ADMIXTURE OF SEED IN GINS.

One of the most serious difficulties in maintaining the uniformity of a superior variety of cotton is the mixture of seed in gins. A few farmers have their own gins or small hand gins for their seed cotton, and in some localities ginning establishments are beginning to provide small gins that are kept clean for ginning seed cotton. Some farmers take care to avoid the mixture of seed by holding their seed cotton until the end of the season, when the time can be taken to clean out the gin. It is also possible to plant progeny rows or seed plats with unginned seed by wetting the lint before planting.

O. F. Cook,
*Bionomist in Charge.*

## REPORT OF RESULTS OF PLANTING

In order to determine the comparative value of the different varieties of cotton in various cotton-growing regions, a report will be requested in the autumn of 1914, to include the following items:

(1) Character of the soil.
(2) Character of the season.
(3) Whether the seed of the new variety was isolated or planted with a local variety for comparison.
(4) Name of local variety used for comparison.
(5) Size and yield of row or plat of the new variety.
(6) Yield of equal row or plat of the local variety.
(7) Rating of the new variety for your section—whether excellent, good, fair, or poor.
(8) A sample of seed cotton representing ten 5-locked bolls, the seed cotton from each boll to be picked carefully and wrapped separately in a small piece of paper.

It is especially requested that growers carefully note the points just enumerated, in order that they may secure the necessary data and be ready to supply accurate information when it is called for next autumn. In this way it is hoped to obtain valuable and reliable information regarding the varieties best adapted to various sections of the cotton belt. Growers receiving this seed who are willing to cooperate with the Department of Agriculture in making the desired test are requested to fill in and return the accompanying franked postal card, which requires no postage.

Growers who wish to share in the special distribution of the following year will be expected to furnish a 10-boll sample of the seed cotton, as mentioned under item 8 of the above list. These samples are to be used for determining the length, quality, and percentage of lint. This information is needed to enable the special distribution of larger quantities of seed (probably half bushels) to be sent to communities that are likely to adopt the new varieties and establish them in regular cultivation.

The samples should be accompanied by the name and address of the grower, as well as the name of the variety grown. It has been necessary to discard many samples because they were not marked and there was no way to identify them.

## VARIETIES DISTRIBUTED.

### LONE STAR.

The Lone Star variety belongs to the Texas big-boll type and was bred in Texas by Dr. D. A. Saunders, of the Bureau of Plant Industry. It was developed from a single superior plant found in a field of Jackson cotton in the Colorado River bottom near Smithville, Tex., in August, 1905.

In 1908 plats of this selection large enough to give a fair test of yield and lint qualities under field conditions were planted at Waco, Denison, and Cuero, Tex. The yield, percentage, and quality of lint were better than in any other variety with which it was compared, and this superiority has been retained in subsequent seasons.

Following is a technical description of this variety:

Plant of medium height with one to four limbs and many long fruiting branches; main stem very short jointed and less hairy than the majority of big-bolled varieties; the limbs ascending, generally producing fruiting branches at their base; fruiting branches numerous, horizontal or ascending, long, medium short jointed; leaves medium to large, very dark green; petioles very long, somewhat drooping or recurved; bolls very large, round or broadly ovate, an inch and a half to an inch and three-fourths in diameter, an inch and three-fourths to 2 inches in length, with very short, blunt points, 35 to 45 to the pound; involucral bracts very large, closely appressed, coarse veined, deeply cut into long teeth, the longest teeth often meeting over the end of fully developed green bolls; pedicels of medium length, an inch and a half in length below to three-fourths of an inch at the top of the main stem and the extreme ends of the primary and fruiting branches; the bur thick and heavy with very blunt points; lint an inch to an inch and an eighth in length, very strong, and of uniform length of fiber, 38 to 40 per cent.

In this variety the limbs begin to develop fruiting branches 4 to 7 inches from their bases instead of near their extremities. This appears to be an advantage under weevil conditions, as in years of heavy infestation the bulk of the crop must be obtained from the lower third of the plant. In selection considerable stress has been laid upon the short-jointed character of the main stem as essential in developing an early fruiting tendency. The habits of growth are similar to those of the well-known Triumph cotton, and under some conditions the two varieties appear almost indistinguishable; but in other places obvious differences appear, and these are in favor of the

Lone Star. The plants are less inclined to become prostrate, the bolls are larger, and the lint longer and more abundant. Very large yields have been reported—more than two bales per acre on measured areas. Under favorable conditions the fiber attains an inch and an eighth in length. Many bales of this cotton have been sold at a premium. The Lone Star is undoubtedly the best variety now available for general planting in the Texas black-land belt and adjacent regions. The variety is best known in the vicinity of Waco, where it is replacing all other types of short-staple Upland cotton.

The seed for this distribution was grown for the Department of Agriculture near Waco, Tex., by Messrs. John Gorham and D. M. Crenshaw, and at Clarksville, Tex., by Morgan Latimer.

### TRICE.

The Trice cotton is an early-maturing short-staple variety developed by Prof. S. M. Bain, of the Tennessee Agricultural Experiment Station, a collaborator of the Bureau of Plant Industry. It is the result of four years' selection from an early variety found on the farm of Mr. Luke Trice, near Henderson, Chester Co., Tenn. The original variety is said to have come from southern Missouri and is known locally in Chester County as "Big-Boll Cluster." In the work of selection particular attention was given to earliness, productiveness, form of stalk, and large bolls, the crops being produced on the farm of Mr. W. N. McFadden, in Fayette County, Tenn. A trial made alongside the original variety in 1908 showed a distinct improvement in all the qualities sought in the selection, as well as greater unformity.

Though developed with special reference to the light, sandy soils of western Tennessee, the variety has given excellent returns in other districts. The most active demand for the seed has come from northern Mississippi, where the invasion of the boll weevil has led to the planting of earlier varieties; but the variety may also prove valuable in other districts not yet invaded by weevils, for it is distinctly superior to King and other varieties prized for extreme earliness. The behavior of an experimental planting of Trice cotton at Norfolk, Va., in the season of 1912 indicates that the variety may be worthy of distribution across the whole northern rim of the cotton belt.

The Trice cotton is thus described:

Plant rather small, 2 to 5 feet high, of Peterkin type, rarely with distinct basal branches, very prolific; fruiting branches numerous, short jointed; leaves light green, of medium size, hirsute; bolls medium to large, ovate, often angular, 4 to 5 locked; seed large, with dense whitish or brownish tuft; lint fine, seven-eighths to 1 inch long; percentage of lint 28 to 33; season early.

This variety having been developed from a cluster type, this character is liable to reappear. The percentage of reversion apparently is greater under more adverse soil conditions. In maintaining the variety cluster plants should be removed from the field as early as possible.

The seed now distributed was grown in 1913 by Mr. T. C. Long in the vicinity of Jackson, Tenn., and Mr. Frank Lindsey, near Norfolk, Va.

### COLUMBIA.

The Columbia cotton is an early long-staple variety well adapted to South Carolina and adjacent States. It was derived from a short-staple variety, the Russell big boll. The first selection was made in 1902 at Columbia, S. C., by Dr. H. J. Webber, formerly in charge of the cotton-breeding work of the Bureau of Plant Industry, and resulted in the finding of a single long-linted plant that gave a superior progeny in 1903. Throughout the process of selection the aim was to select plants having the Russell type of branching and boll, so that the plant of the Columbia is scarcely recognizable as distinct from the Russell variety. The very large boll has also been retained and the variety is in every respect of true Upland type aside from the length of lint and the color of the fuzz.

The Russell variety produces a large seed covered with dark-green fuzz. This character is very undesirable, owing to the discoloration of the lint if ginned while somewhat wet by the pulling off of the green fuzz and also owing to the green color giving undesirable linters. In breeding this variety by selection, therefore, special attention has been given to selecting a white seed. The great majority of the plants of the Columbia variety now produce white seed, but this character has not as yet been entirely fixed and some green seed continues to be produced. There is also a tendency to produce occasional plants with greenish lint. These should be rejected in picking, as the lint is worthless and produces an undesirable discoloration in the bale. The proportion of green seeds is much larger in some seasons than in others, owing to some influence of external conditions not yet understood.

The following is a technical description of this variety:

Plant low, compact, of Russell type, having several long, branching basal limbs, vigorous, prolific; bolls large to very large, ovate, short pointed, opening well, mainly 5 locked; seeds large, fuzzy, white or greenish, 8 to 10 per lock; lint very strong, from 1¼ to 1$\frac{7}{16}$ inches in length, fine, silky, and very uniform in length; percentage of lint 29 to 33; season early in comparison with the older long-staple varieties.

As a result of continued high prices for long-staple Upland cotton, Columbia cotton is being quite extensively planted in South Carolina

and adjacent States, and especially in the region of Columbia and Hartsville, where supplies of select seed are being maintained by Mr. R. C. Keenan and Dr. D. R. Coker.

The Columbia cotton is increasing rapidly in popularity and in some neighborhoods has become the dominant variety. Growers accessible to long-staple markets usually secure a premium of 5 cents or more above corresponding grades of short-staple cotton. Contrary to the general impression that long-staple varieties are unproductive, the Columbia cotton often outyields short-staple varieties grown under the same conditions. The danger now is that failure to keep the seed pure will result in the production of large quantities of uneven fiber that will injure the reputation of the variety. Hence the importance of continued distribution of a select seed. It is also important that communities undertaking to produce long-staple cotton should provide themselves with facilities for maintaining the uniformity of select varieties.

In order to secure a premium it is necessary to pick the cotton with care, not only to exclude leaves and other "trash," but to avoid immature and weather-stained bolls. It is also necessary that the cotton be dry before ginning, but not "dead" and harsh. The lint should feel "alive." The grower is also to be warned against allowing long and short cotton to be mixed in the same bale. There is no market for mixed bales.

In some localities it is believed that the Columbia cotton suffers more than the other varieties from the rotting of the bolls through attacks of anthracnose or from other causes. These dangers are increased when conditions favor such a luxuriant development of foliage that the bolls are kept moist by heavy shade. The planting of Columbia cotton in Texas is not advised, though excellent results are reported from some localities in the coast belt. The good qualities of the variety are not retained under the more extreme conditions that are often encountered in the drier regions of the Southwest.

The seed for this distribution was grown in 1913 by Messrs. C. H. Carpenter, Easley, S. C., and R. C. Keenan, Columbia, S. C.

### FOSTER.

The Foster variety was bred by Dr. D. A. Saunders from a cross between Mebane's Triumph, a Texas big-boll short-staple cotton, and Sunflower, a standard Upland long-staple cotton. The object in making the cross was to obtain a medium long-staple cotton early enough to give profitable yields under boll-weevil conditions, and this purpose has been attained. The variety has been bred and tested under severe weevil conditions, and usually behaves as a very early and prolific variety, even on alluvial soils where other varieties

of long-staple cotton become too luxuriant. Excellent crops of Foster cotton have been raised for several years past, and good reports have been received from numerous localities in Mississippi and Louisiana. The Foster is undoubtedly the best long-staple variety now available as a substitute for the old late-maturing "Peeler" varieties in the region where these were formerly grown. Some of the seed has been sold in Mississippi under the name "Unknown."

Under river-bottom conditions the bolls are large, averaging 50 to the pound, but when grown under the climatic and soil conditions existing in the black-land prairie regions of Texas the bolls are very much smaller. The lint is still somewhat variable, running from 1⅛ to 1⅜ inches, depending largely on external conditions. This irregularity in the length of the lint is probably traceable to the hybrid origin of the variety. The short lint is usually found on plants with larger and broader leaves, like the Triumph ancestor. The difference in foliage makes it easy to rogue out the aberrant plants and thus prevent the diversity from increasing. If this precaution be taken, very satisfactory behavior may be expected.

A technical description of the Foster variety follows:

Plant compact, having few erect primary branches and many fruiting branches; fruiting branches long. Leaves short pointed, somewhat drooping, medium sized, thick, dark green. Bolls large, 50 to the pound, ovate, blunt, sharp pointed, largely 5 locked. Lint strong and of fine quality, 1⅛ to 1⅜ inches, very abundant, the percentage averaging 34. Seed medium to small, with grayish brown tuft.

The seed for this distribution was grown by Dr. Morgan Latimer, Clarksville, Tex.

### DURANGO.

The Durango is a new type of Upland long-staple cotton, introduced and acclimatized by the Department of Agriculture and now distributed for the second time. The original stock of seed came from the Mexican State of Durango, but the variety has been grown and selected for several years in Texas, chiefly at Del Rio and San Antonio. The results of numerous experiments justify the recommendation of the Durango cotton as an early productive variety well suited to cultivation in weevil-infested regions and also in the irrigated districts of the Southwest.

The lint is of excellent quality and attains a length of an inch and a quarter under favorable conditions. The bales of Durango cotton thus far produced have been sold at from 2 to 10 cents a pound above the prevailing market prices of short-staple cotton, premiums of 5 or 6 cents being the rule. The Durango cotton is less injured by drought than other long-staple varieties, though the length or quality of the lint is affected by extreme conditions.

In the Imperial Valley of California this variety has recently attained great popularity, which has resulted in the purchase by the California planters of all the selected stocks of seed available in Texas. This is because the Durango cotton has outyielded the short-staple varieties, as well as producing lint of much higher value.

Following is a short technical description of this variety:

Plant of upright habit, with a strong central stalk and rather stiff, ascending vegetative branches. Fruiting branches of moderate length or rather short, under some conditions becoming semicluster. Foliage rather deep green, reddening rather early in the season. Leaves of medium size, usually with 5 or 7 rather narrow tapering lobes, leaves with 3 lobes being less frequent than in most other varieties of Upland cotton. Involucral bracts with rather small, triangular cordate bracts, margined with rather short teeth. Calyx lobes rather irregular in length, sometimes very long and slender. Bolls of medium or rather large size; under favorable conditions about 60 to the pound. Shape of bolls, conic oval, with rather smooth surface, the oil glands deeply buried. The proportion of 5-locked bolls varies usually from 40 to 50 per cent. Seeds of medium size, covered with white fuzz and bearing abundant even lint about 1¼ inches long under favorable conditions.

More complete accounts of the characters and habits of the Durango cotton in comparison with those of other varieties are to be found in several of the publications of the Department of Agriculture.[1]

The seed for this distribution was grown in the vicinity of Victoria, Tex., by J. H. Fleming, and by L. S. Mumford, of Laneville, Ala., Frank Lindsay, of Norfolk, Va., and C. H. Carpenter, of Easley, S. C.

### UTOPIA.

The Utopia variety has been bred by Col. William L. Peek, of Conyers, Ga. It is a very productive stock and shows a notable uniformity, both in the characters of the plants in the field and in the lint and seed characters. Though not a late variety, the Utopia is not so early as some others, and this may prove a disadvantage under weevil conditions. A small distribution is being made this season, chiefly confined to the region of northern Georgia, where the variety is known to be well adapted to the local conditions.

The Utopia cotton may be described as follows:

Plants vigorous and upright, with very few vegetative branches; fruiting branches short jointed but not closely clustered; foliage deep green; bolls medium, round, the ripe bolls retaining their upright position, 65 to 75 to the pound; seed medium large, white or gray, the fuzz being rather short and even; lint quite abundant, a fair inch and very uniform in length. The variety may be considered as "storm proof," in that the cotton does not fall out, though the bolls remain in an upright position.

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[1] Relation of Drought to Weevil Resistance in Cotton, Bulletin 220, Bureau of Plant Industry, and Cotton Improvement under Weevil Conditions, Farmers' Bulletin 501, U. S. Department of Agriculture.

In a comparative test with 14 other varieties at Conyers, Ga., in the season of 1913, the Utopia ranked among the first in productiveness, 1,200 to 1,250 pounds making a 500-pound bale. The fields where the seed was raised were free from the anthracnose disease.

### DIXIE, A WILT-RESISTANT VARIETY.

The Dixie wilt-resistant cotton had its origin in a resistant individual selection made at Troy, Ala., in 1902. The plant was presumably an accidental hybrid between two of the numerous varieties of Upland cotton being grown there on wilt-infected land. This line of work was begun by Mr. W. A. Orton with the object of producing a strain of cotton that could be successfully grown on lands that were infected with the "wilt" or "black-root" disease. From this original selection a uniform strain was developed which proved highly resistant to wilt and which was subsequently named "Dixie." During the succeeding years of its development the variety has been bred by the most careful methods of individual selection and progeny-row tests, always being planted on wilt-infected land so that nonresistant plants would be eliminated as they appeared and only the most resistant retained. As a result the variety has been considerably improved in uniformity, wilt resistance, earliness, size of boll, and length of lint.

Through the planting of the wilt-resistant Dixie cotton, combined with the use of the root-knot rotations outlined below, the wilt or black-root disease is being successfully controlled. The variety has now been grown on a large scale throughout the wilt-infected sections of South Carolina, Georgia, Alabama, and other States for several years and has proved well adapted to use on land where other varieties suffer severe loss from wilt. Crops of a bale or more per acre have been grown in numerous localities on such wilt-infected land. Farmers owning hundreds of acres of land on which wilt reduced the crop 50 to 75 per cent with ordinary varieties have stated that the use of Dixie cotton has saved them from financial ruin.

The following is a technical description of the variety:

Plant vigorous, wilt resistant, of medium height, pyramidal, nearly of the Peterkin type, usually with two or more large basal branches and with long, slender, slightly drooping fruit limbs; leaves of medium size; bolls of medium size, about 75 being required for 1 pound of seed cotton, easy to pick, but very storm proof; seed small, weight of 100 seeds 10 grams, variable in color, but typically covered with greenish brown fuzz; lint about seven-eighths of an inch; percentage of lint to seed 34 to 35.

Root-knot is very generally associated with the wilt disease and is by many farmers confused with it. The two diseases are distinct and require different methods of treatment. Wilt is caused by the

attacks of the fungus *Fusarium vasinfectum*, which penetrates, grows in, and plugs the water-carrying vessels of the plants, thus preventing the rise of water. This disease attacks only cotton and okra. Root-knot is caused by nematodes, or eelworms, microscopic in size, which bore into the roots and cause knots or swellings on them. These nematode-infected areas of the root are thereby weakened and furnish points of entrance for the wilt fungus. Root-knot is known to attack many farm crops besides cotton, notably cowpeas, tomatoes, cucumbers, and cantaloupes. The damage resulting from the two diseases occurring together is much greater than from either alone.

Different methods of treatment are necessary for the control of the troubles. Wilt can be successfully controlled by planting a wilt-resistant variety of cotton in connection with the usual crop rotations practiced by the best farmers. When root-knot occurs on land already infected with the wilt disease no cotton should be planted on it until the diseased field has been rotated one, two, or three years, according to the severity of the disease, with crops immune to the trouble. The best rotations for such root-knot infected land include corn, barley, oats, wheat, rye, Iron or Brabham cowpeas (these are the only commercial varieties known to be resistant to root-knot), velvet beans, peanuts, and beggarweed. The individual farmer can make up from this list of crops the rotations best suited to his locality and system of farming. The object in view is to starve out the nematodes by planting crops on which they can not live. After the root-knot has been thus reduced by rotation, the Dixie wilt-resistant variety of cotton should be planted on land which also has the wilt disease.

The seed for this distribution was grown in 1913 by Mr. J. C. C. Brunson, Florence, S. C., under the supervision of Mr. W. W. Gilbert, who has arranged the distribution of Dixie cotton seed for the season of 1914.

WASHINGTON : GOVERNMENT PRINTING OFFICE : 1914